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# RICKETS IN SHEEP: FIELD TRIALS IN EAST ANGLIA

BY

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## INTRODUCTION

Rickets in young sheep appears not to be a common disease in Great Britain, although Elliot & Orr (1926) claimed that "bent leg" was of widespread occurrence in Scotland, and that it could be prevented by feeding a calcium supplement and cod-liver oil. Auchinachie & Fraser (1932) found that 10 ml. cod-liver oil daily was as fully protecting as extra calcium given to young sheep kept inside and given an experimental diet low in calcium and high in phosphorus (Ca:P. 1·13). The only other study concerned with rickets in sheep (Duckworth *et al.*, 1943) conducted in this country in recent years was an experimental approach to the problem of the relation between rate of growth and vitamin D.

Various other osteodystrophic disorders of sheep have been reported, such as "cripples" (Lyle Stewart, 1933) in Northumberland and "cappie" or "double scaup" (Bowes, 1932) in Yorkshire, but although the former has been called rickets, there is evidence from the blood chemical values given by Shearer & Stewart (1931), the pathological examination of Innes (1934) and the experimental feeding by Piercy (1934a-b) that this condition is in fact not rickets.

Rickets in young ruminants is the result of a deficiency of phosphorus, calcium or of vitamin D, or a gross imbalance of these minerals which may or may not be associated with suboptimal intake of the vitamin. While serious phosphorus deficiency occurs at times in the chemical composition of pastures in many countries, and has been directly implicated as the cause of rickets and osteomalacia in South Africa (Theiler *et al.*, 1924, 1934), Australia (Richardson *et al.*, 1931), serious calcium deficiency does not apparently occur normally. The work of Woodman and his co-workers (1926 to 1930) in England and Cruichshank (1926) in Scotland has certainly shown that there is a drop in both phosphorus and protein during winter months, but the degree of deficiency under temperate, even-rainfall conditions, is not serious. Lack of vitamin D, however, from pasture or fodder crops, associated with a concurrent suboptimal degree of endogenous vitamin synthesis from irradiation may occur over much of Great Britain, since the angle of incidence of sunlight during several winter months is less than 35° (Tisdall & Brown, 1929). That such deficiency states may indeed exist in some parts of Britain is shown by the occurrence of osteomalacia in young cattle (Ewer & Sellers, 1950) and of rickets in calves (Field, Sellers & Ewer, 1950) in East Anglia.

It has been shown (Ewer & Bartrum, 1948) that young sheep grazing upon a wide variety of fodder crops and autmn-sown pasture during the fairly severe winter conditions of the South Island of New Zealand, frequently showed an increase in the rate of weight gain when given a single massive dose of vitamin $D_2$ in late autumn. This occurred when only a small number of control animals showed clinical evidence of rickets, as judged by lowered blood inorganic phosphorus values or stiffness of gait. It had previously been shown (Fitch & Ewer, 1944) that vitamin $D_2$ had equal efficacy whether given subcutaneously or orally and that the method of single massive dosage ($1 \times 10^6$ I.U.) was as effective as it was convenient. Since no field trials of this nature have been reported from Great Britain, an opportunity was sought to investigate whether hoggets in East Anglia would respond to additional vitamin $D_2$ during their first winter. Unfortunately in these latter times the total number of sheep kept in East Anglia has been greatly reduced, and in Cambridgeshire only scattered, small flocks are to be found to-day. This has meant that optimum experimental conditions were quite impossible of attainment, particularly in so far as numbers of sheep and variety of feeding practice were concerned. The results of experiments conducted during the winters of 1947-48 and 1948-49 are briefly reported. During the first winter, three trials were made on different farms, two on which the sheep husbandry was poor and one where it was very good.

In the winter of 1948-49, rather than repeat the attempt of observing a fairly large number of sheep on several widely scattered properties, a smaller number of hoggets were more closely observed at the farm which forms part of the Department of Animal Pathology.

## EXPERIMENTAL

### EXPERIMENT 1

During the winter of 1947-48, 55 stud Suffolk ram lambs were made available for experiment at Stetchworth, near Newmarket. These had been born early in the preceding spring, mainly in February

On November 20th they were all number tattooed in an ear and weighed. Forty lambs with the lowest weight range were selected and randomised into two equal groups. The ram lambs in Group 1 were given a massive dose of vitamin $D_2$ by mouth (25 m. calciferol, approximately $1 \times 10^6$ I.U., dissolved in 10 ml. arachis oil) on November 21st, while Group 2 acted as untreated control animals. A second dose was given to the remaining hoggets in Group 1 on March 15th.

At the beginning all the sheep appeared to be in a most thriving condition and were at this period grazing abundant second-growth rape. They continued on this feed over the following few weeks, but were brought inside for shearing at the beginning of December. Henceforth they remained indoors in a large covered yard until the trial ended.

Their ration consised of fair quality hay, mangolds and a grain mixture. Approximate amounts were as follows:—

Hay, 1·0 lb.; mangolds, 15·0 lb.; grain, 0·82 lb. (oats, 5 parts; peas, 1 part).

Later in the winter, mangolds were replaced by sugar-beet pulp, more hay and less grain was fed, and, finally, during the last few weeks, swedes formed the main ingredient.

The sheep were weighed at monthly intervals and during the last three months a random selection of rams from each group were bled on the weighing days in order to determine levels of blood inorganic phosphorus and serum calcium. Unfortunately the owner decided to send seven ram lambs for slaughter on February 24th and eight more were sent on March 16th, although approximately equal numbers were taken from each group on both occasions.

The trial ended on April 20th.

*Results*

The mean weight gains for both groups and blood inorganic phosphorus and serum calcium values are shown in Fig. 1.

When allowance is made for the sheep disposed of before the end of the trial, the total mean weight gains for the two groups are as follows:—

Vitamin D=74·6 lb. Control=74·1 lb.

Clearly no better growth has resulted over the whole five months from the addition of vitamin $D_2$. But during the first 55 days of the experiment the vitamin D treated sheep made a gain of 32·2 lb., while the control sheep only gained 26·8 lb., a difference which is statistically significant at the 5 per cent. level. Later the control sheep made good the weight deficiency, but following the second administration of vitamin $D_2$ in March, the treated animals made a mean weight gain of 16·2 lb. during the following 32 days compared with 15·0 lb. gained by the control group.

The blood phosphorus and calcium values remained within normal limits and there was never any sign of ill-health.

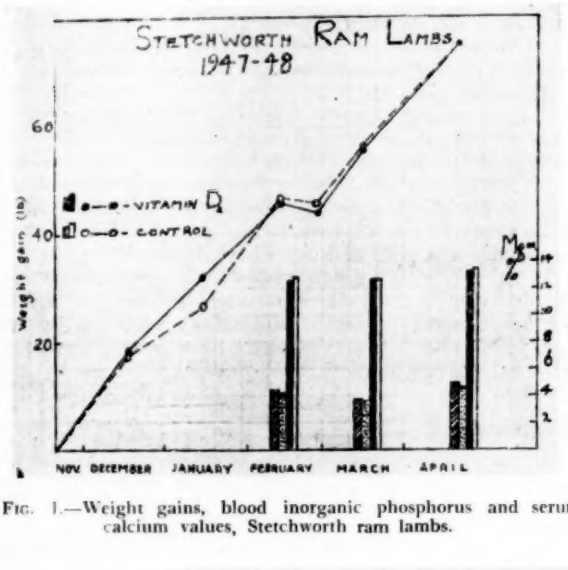


FIG. 1.—Weight gains, blood inorganic phosphorus and serum calcium values, Stetchworth ram lambs.

EXPERIMENT 2

A small flock of ram lambs belonging to the A.R.C. Unit of Animal Reproduction was brought to the department. There were, unfortunately, only eleven ram lambs available, consisting of seven Romney Marsh and four Suffolks. They arrived on November 14th and were given until December 1st to settle down. On that day they were weighed and half of the rams of each breed were given vitamin $D_2$ at the rate of 20,000 I.U. per kg. subcutaneously. Blood samples were taken for calcium, phosphorus and alkaline phosphatase estimation, and afterwards the sheep turned out to pasture. They were subsequently weighed and bled at intervals varying from a few days to a month.

There was a moderate amount of feed available to start with but of low quality through shortage of clovers. As the pasture became scarcer, hay and mangolds were offered to them *ad lib.*, but growth was unsatisfactory. The sheep were not in good condition when they arrived, a few showing evidence of scouring. They had, however, been treated for internal parasites just before coming to us, and it was not until two of the smaller animals died some weeks later that a parasitological examination of faeces was made and heavy nematode infestation revealed. They were drenched with 30 grammes phenothiazine on February 2nd and kept in an open yard on a hay and concentrate ration for three weeks. Following the marked weight improvement revealed at the weighing on February 25th, the vitamin D treated sheep were given another dose of calciferol and put out to short pasture with a small daily supplement of linseed cake.

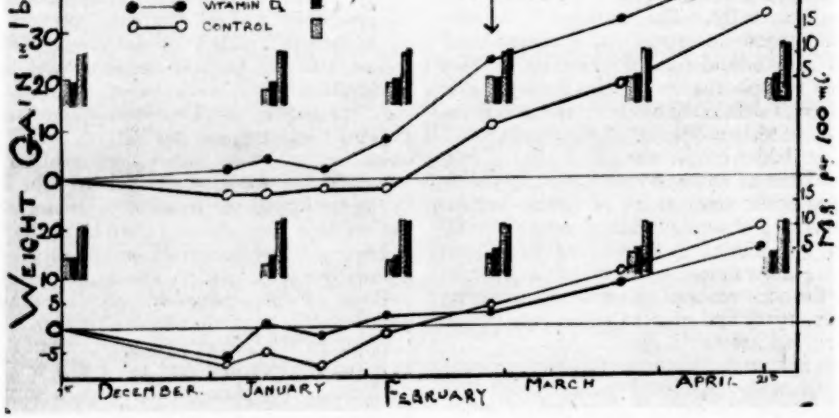


FIG. 2.—Weight gains of mixed ram lambs and mean blood inorganic phosphorus and serum calcium values.

At the conclusion of the experiment on April 21st, in addition to weighing and removal of blood samples, an X-ray examination was made of the distal epiphysis of the radius of each sheep.

*Results*

The weight gains, blood inorganic phosphorus and serum calcium values are shown in Fig 2.

Apart from the much better growth made by the Suffolk hoggets, the main interest is in the different breed response to the vitamin D treatment. Unfortunately the numbers of experimental animals of both breeds are too small to permit more than tentative conclusions. While serum calcium values remained at a normal level throughout, a drop in the blood inorganic phosphorus values occurred in the control sheep of both breeds. The radiographs showed a mild degree of rickets in most of the control sheep of both breeds but none in any vitamin D treated sheep.

EXPERIMENT 3

In October, 1948, 18 Suffolk lambs, ewes and wethers were bought at a sale as one line. After arrival at the department farm they were kept on pasture a fortnight before being dosed with 20g. phenothiazine to eliminate or reduce worm infestation, ear-tagged and weighed. For the five days following they were grazed upon 2 acres of young, second-growth green oats in which there was a fairly high proportion of weeds and twitch grass. On October 28th they were again weighed, radiographed and blood samples taken for phosphorus and calcium analysis. They were divided into three groups on a weight basis and given the following treatment :—

*Group* 1.—Vitamin $D_2$ (25 mg. calciferol in 20 ml. arachis oil $1 \times 10^6$ I.U.) given orally.

*Group* 2.—Vitamin $D_3$ (a proprietary concentrate) given at the same rate and in the same way as Group 1.

*Group* 3.—Control (20 ml. arachis oil only).

The sheep were put back on the green oats for another three weeks, but from November 25th to January 3rd they were grazing pasture alone.

When weighed on December 22nd, all sheep were found to have lost weight. Hay was at once put out, but over the Christmas and New Year period four sheep died (two from each of Groups 2 and 3). *Post-mortem* examination of one of these showed evidence of heavy infestation with *Ostertagia* spp., which was confirmed by faecal egg counts made upon all hoggets a few days later, on January 3rd. This clearly revealed an exceptionally high level of infestation by trichostrongylid worms, particularly in some sheep.

All sheep were drenched the same day with 30 grammes of phenothiazine and for three weeks were kept in an open yard and given lucerne chaff and linseed nuts.

On January 21st the hoggets were put back into the 6-acre grass field and given a small daily ration of crushed oats and linseed cake, since there was little grazing at this mid-winter period.

By March 22nd there was sufficient feed available on the green oats and the sheep were grazed here until the end of the trial on May 6th.

In addition to the X-ray examination made of the distal epiphysis of the radius of each sheep at the beginning of the experiment, further radiographs were taken on March 22nd and May 6th.

*Results*

The mean weight gains are shown in Fig. 3 and the mean phosphorus and calcium values of the blood summarised in Fig 4. It should be said that the severe fall in blood inorganic phosphorus shown by the control group is mainly due to two sheep, one of whom (No. 47) gave values of 1·5 mg. per cent. and 1·8 mg. per cent. in February and March. This animal had much the most serious degree of rickets, being very stiff in its movements as well as giving strongly positive radiological evidence.

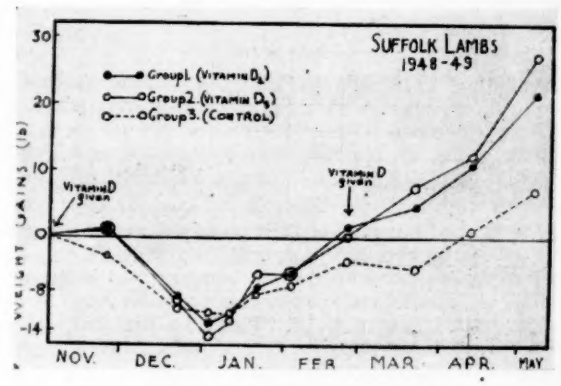


FIG. 3.—Weight gains of mixed Suffolk lambs.

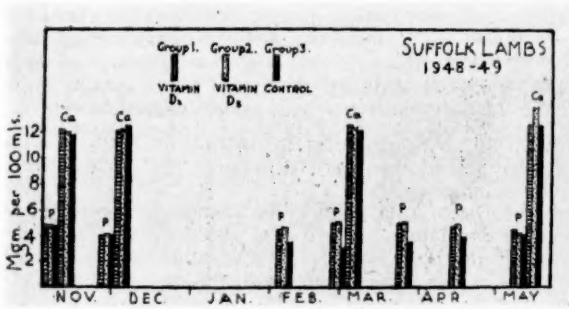


FIG. 4.—Mean blood inorganic phosphorus and serum calcium values of mixed Suffolk lambs.

The results of the X-ray examination of the radial epiphyses are shown in Table 1.

TABLE I

X-RAY EXAMINATION OF DISTAL EPIPHYSIS OF RADIUS

| Group | Sheep | 2.11.48 | 22.3.49 | 6.5.49 |
|---|---|---|---|---|
| 1 (Vitamin $D_2$) | 49 | N | ± | N |
| | 54 | N | — | N |
| | 55 | N | N | N |
| | 57 | N | N | N |
| | 58 | N | ± | N |
| | 60 | N | — | N |
| 2 (Vitamin $D_3$) | 48 | N | + | ± |
| | 50 | N | N | N |
| | 51 | N | N | N |
| | 59 | N | — | N |
| 3 (Control) | 46 | N | ± | ± |
| | 47 | N | +++ | ++ |
| | 56 | N | ± | ± |
| | 61 | N | + | ± |

N = Normal.
— = Slightly defective calcification.
± = Definite " "
+, ++, +++ = Increasing degrees of rickets.

Although the disappearance of the mild rickets discernible in a few of the sheep of both vitamin D treated groups between March and May may have been due to the second dosing with the vitamin preparations, there is evidence from the control group that the anti-rachitic effect of increasing quantities of ultra-violet radiation during April was also a factor helping recovery.

## Discussion

While it is to be regretted that much larger numbers of young sheep experiencing their first winter were not available for experimental study, there seems little doubt that in Suffolk lambs, at any rate, rickets can occur in the field and that there can be a response to additional supplies of vitamin D.

The level of nutrition of the ram lambs in the first trial was, of course, of a very high order, and only the fact that they were valuable stud animals being pressed to grow as rapidly as possible could justify such costly feeding. Nevertheless, ram lambs have been found by the writer to be more prone to develop rickets than either ewe or wether lambs of the same age, while Norman & Mitler (1948) have shown that the male sex hormone is itself rachitogenic. It is likely, therefore, that the maintenance of a mean daily weight gain of nearly 0·59 lb. in sheep of this age kept entirely indoors means a correspondingly high vitamin D requirement. The indication from this trial is that under such special conditions massive vitamin D dosage at six to eight weekly intervals during the mid-winter months would enable high growth rates to be maintained in safety.

With the Suffolk lambs in experiments 2 and 3 overwintered out of doors at the farm of the Department of Animal Pathology, rickets of varying degree of severity was found to occur in a majority of animals not protected by additional vitamin D. It was necessary to change the grazing of these hoggets several times and, although analyses of the mineral content of the diet was not made, the fact that the blood inorganic phosphorus levels of the untreated sheep fell, probably indicates that, in addition to the vitamin D intake from both exogenous and endogenous sources being inadequate at this time of year, the phosphorus intake was also minimal.

The severe nematode infestation which developed amongst all groups in the earlier part of the winter caused a serious setback and was a striking illustration of the danger of pastures to over-wintering lambs. It has been shown (Stewart, 1935; Franklin *et al.*, 1946) that the absorption of minerals can be interfered with by chronic infestation with *Trichostrongylus* spp., but although the occurrence of such a thing in the outbreak of ostertagiasis suffered by our sheep cannot be ruled out, no correlation was found between high faecal worm egg count and low blood phosphorus values. In other words, it seems probable that the helminthiasis complicated this trial mainly because the sharp weight loss for which it can be held responsible temporarily obliterated the growth-promoting as well as the rickets-preventing power of vitamin D.

The serum calcium levels of the sheep in these experiments always remained within the normal range and were thus closely similar to the usual manifestation of alteration in blood mineral balance in ovine rickets. In the sheep which showed the really severe rickets (No. 47) in the control group of experiment 3, the blood inorganic phosphorus level fell from 5·3 mg. per cent. at the beginning to 1·5 mg. per cent. 119 days later, while the serum calcium level remained at or above the initial figure of 11·5 mg. per cent. throughout.

In view of the small number of sheep employed, it is not possible to draw any conclusions upon the relative prophylactic value of vitamins $D_2$ or $D_3$. The indication given by experiment 3 is that in the sheep, as has been found in the human and rat, calciferol (vitamin $D_2$) and 7 dehydrocholesterol (vitamin $D_3$) are of equal value.

## Summary

(1) The vitamin D requirement of ram lambs is high, and when Suffolk rams during their first winter were kept inside and highly fed, additional large dosage of vitamin $D_2$ increased growth.

(2) When a small number of Romney Marsh and Suffolk ram lambs were over-wintered outside and given a small grain and oil cake supplement to rather poor pasture, vitamin $D_2$ prevented a fall in blood inorganic phosphorus and the occurrence of mild rickets. Only in the Suffolk rams did the additional vitamin D exert a favourable effect on growth.

(3) Rickets with characteristic hypophosphataemia and pathological bony changes occurred in mixed Suffolk ewe and wether lambs over-wintered outside and fed a diet which included green oats, old pasture and concentrates, but little hay. Two large doses of vitamin D proved effective in maintaining blood phosphorus levels and preventing all but the mildest radiographic evidence of rickets.

(4) There appeared to be no difference between the prophylactic efficacy of vitamin $D_2$ or vitamin $D_3$ for sheep in this trial.

*Acknowledgments.*—I am greatly indebted to Mr. Elkerton, agent of the Countess of Ellesmere, who arranged for me to use the ram lambs in experiment 1, and to Dr. John Hammond for lending me the rams used in experiment 2.

This work was carried out while holding a Research Fellowship of the Animal Health Trust.

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## ABSTRACTS

[**The Control of Equine Strongylosis and Periodic Ophthalmia with a Ration-Additive.** QUIN, A. H. (1950.) *Brit. Vet. J.* **106.** 116–118.]

The author has attempted to supplement the ration of young thoroughbred horses with suboptimal doses of phenothiazine to inhibit the egg-laying of strongyle worms; the supplementation also included riboflavin to prevent the occurrence of periodic ophthalmia (moon blindness). The supplementary mixture was made up as follows:—

| | |
|---|---|
| Phenothiazine ... ... ... ... | 30 grains |
| Riboflavin ... ... ... ... | 40 mg. |
| Vitamin D ... ... ... ... | 1,000 I. U. |
| Potassium Iodide ... ... ... | 10,000 P.P.M. |
| Manganese Chloride ... ... ... | 100 P.P.M. |
| Copper Sulphate ... ... ... | 100 P.P.M. |
| Cobalt Sulphate ... ... ... | 100 P.P.M. |
| Iron Sulphate ... ... ... ... | 10,000 P.P.M. |
| Calcium Phosphate and Sweetened Base | *q.s.* |

Sixteen thoroughbred yearlings were included in the observations. Medication consisted of a tablespoonful of the above formula mixed with the grain ration for 21 days. Medication was then withheld for a week and then repeated for another three weeks. This alternation of medication was continued over a 13-week period. Faecal samples were collected at the ninth and 13th week of treatment. The faeces of 12 of the yearlings were completely negative for strongyle eggs. The remaining four yearlings gave egg counts of under 400 strongyle eggs per gramme. No effect was noticed on ascarid egg counts. The general condition of the yearlings was very good.

D. L. H

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[**Actions (*in vitro*) of Chloramphenicol and 4-4′-Diaminodiphenylsulphone on Bacteria Associated with Bovine Mastitis.** (Trans. title.) FAUSTINI, S. (1950.) *La Clinica Veterinaria.* **73.** 99–105.]

Dr. Faustini has carried out ***in vitro*** tests on the actions of chloramphenicol and 4-4′-diaminodiphenylsulphone, separately and together, on bacteria associated with bovine mastitis. The Gram-positive bacteria used were six strains of streptococci from natural cases, and (from the American Collection of Type Cultures) *Str. agalactiae, Str. dysgalactiae, Str. uberis, Str. pyogenes* and *Staph. aureus.* The Gram-negative bacteria used were *Sal. paratyphi A* and *B* and three strains of *E. coli.*

It was found that chloramphenicol had about the same effect on Gram-positive germs as penicillin, but it was markedly superior in its inhibitory effect to streptomycin and 4-4′-diaminodiphenylsulphone.

Chloramphenicol was much more inhibitory to Gram-negative bacteria than penicillin, streptomycin or 4-4′-diaminodiphenylsulphone.

When chloramphenicol and 4-4′-diaminodiphenylsulphone were used together on both Gram-positive and Gram-negative bacteria, their combined action was much more marked than their separate effects. This synergistic action is thought to be due to each drug attacking the growing organism at a different stage in its development, thus reducing the chances of survival; or possibly one drug is capable of destroying those strains of a bacterium which are resistant to the action of the other drug.

I. W. J.

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[**Progress Report on Avianized Anti-Rabies Vaccination Project.** STARR, L. E., STAFFORD, A. L., & DYE, O. B. Proc. Fifty-third Annual Meeting U.S. Livestock Sanitary Association.]

Present U.S. rabies immunisation agents consist of 20 per cent. brain suspension containing fixed killed virus. These induce in dogs an uncertain immunity lasting only about one year, while not infrequently their use results in the formation of abscesses at the site of inoculation and paralysis. These disadvantages make it impossible to persuade more than 60 per cent. of owners to have their dogs vaccinated; yet at least 80 per cent. require to be vaccinated to check the disease. For these reasons the authors are carrying out field trials with viable vaccine attenuated by passage of Flury strain in chick embryos. To date, 422 dogs, 121 cattle and 15 goats have been vaccinated. Neither abscesses nor paralysis were encountered. Only one dog showed a thermal response, although about ten of them had been bitten by rabid dogs a few days before vaccination. Cattle from three herds had been exposed to rabies before vaccination and in one herd, within a month, 15 to 81 died of atypical rabies, shown to be due to street, not vaccine, virus. The symptoms were presumably atypical by reason of the interfering action of the vaccine virus. It is concluded that the vaccine does not produce rabies, abscesses or post-vaccinal paralysis and can be used on previously immunised animals with no danger of reaction.

A. W. G.

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[**Review of the Chick Embryo Adapted Living Rabies Virus Vaccines, with Primary Emphasis on Use in Dogs.** COX, H. R. Proc. Fifty-third Annual Meeting U.S. Livestock Sanitary Association.]

By growing in chick embryos the Flury strain of rabies virus (isolated from a child's spinal cord) it became less virulent for rabbits inoculated intracerebally and quite avirulent by intramuscular inoculation. More passages in eggs were required before the virus was attenuated for guinea-pigs, but attenuated virus rendered the pigs immune. Further tests in rabbits and guinea-pigs showed the virus to induce an immunity proportional to the amount of vaccine virus injected. The vaccine was tried in dogs to determine its safety and efficacy. At least 220 dogs were vaccinated without ill-effects during an observation period of eight months. Of 76 dogs challenged 3 to 27 weeks after being vaccinated with 36th to 84th egg passage virus, two died, whereas 32 to 46 controls died. Moreover, both the deaths were from a group of eight dogs vaccinated with 84th passage virus. In a field trial 6,757 dogs were vaccinated with five casualties, none of these being ascribed to the vaccine. To these must be added the results described in previous abstract.

A. W. G.

# NOTES AND NEWS

### Diary of Events

Oct. 17th.—Meeting of the Southern Counties Division, N.V.M.A., at Winchester (Royal Hotel), 6 p.m.

Oct. 17th.—Meeting of the Agriculture Group of the Society of Chemical Industry, at the Chemistry Lecture Theatre at the Royal College of Science, S.W.7, 2.30 p.m. (Dr. K. L. Blaxter, of the Hannah Dairy Research Institute: "Iodinated Proteins and Thyroxine in Animal Husbandry.")

Oct. 18th.—Meeting of the Scottish Metropolitan Division, N.V.M.A., at Edinburgh (Moredun Institute), 3.30 p.m. (The meeting will follow the James Clark Memorial Unveiling Ceremony.)

Oct. 19th.—Meeting of the Hertfordshire and Bedfordshire Division, N.V.M.A., at St. Albans (70, Holywell Hill), 2.30 p.m.

Oct. 19th.—Meeting of the South-Eastern Division, N.V.M.A., at Tunbridge Wells (Royal Mount Ephraim Hotel), 2.30 p.m.

Oct. 20th.—Autumn meeting of the Eastern Counties Division, N.V.M.A., at Ipswich (Great White Horse Hotel), 2 p.m.

Oct. 20th.—Meeting of the North of Ireland Division, N.V.M.A. in the Lecture Theatre, Queen's University, Elmwood Avenue, Belfast, 7 p.m.

Oct. 20th.—Meeting of the Biochemical Society, in the National Institute for Medical Research, The Ridgeway, Mill Hill, London, N.W.7, 11 a.m.

### N.V.M.A. Council and Committee Meetings

The next Council and Committee Meetings of the Association will be held in London on October 30th, 31st, and November 1st. The time-table is as follows:—

*Monday, October 30th, at 36, Gordon Square, W.C.*1.
2 p.m.—Organising Committee.
4 p.m.—Home Appointments Committee.

*Tuesday, October 31st, at 36, Gordon Square, W.C.*1.
9.30 a.m.—Parliamentary and Public Relations Committee.
10.30 a.m.—Veterinary State Medicine Committee.
2.30 p.m.—General Purposes and Finance Committee.

*Wednesday, November 1st, at the Connaught Rooms, Great Queen Street (off Kingsway), W.C.*2.
11 a.m.—Council Meeting.

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### CONFERENCE ON ARTIFICIAL INSEMINATION

Members intending to be present at the Association's Conference on Artificial Insemination to be held on Thursday, November 2nd, 1950, in the Auditorium, The Wellcome Research Institute, Euston Road, London, N.W.1, are asked to notify headquarters N.V.M.A. *not later than Friday, October 27th.* Numbers are required for catering purposes.


## NOTICE TO ADVERTISERS

**Advertisements will be received at 36, Gordon Square, W.C.1, up to first post Tuesday morning. They cannot be accepted unless prepaid. with Box Number Fee.**


## NOTICES

### Eastern Counties Division, N.V.M.A.

THE Autumn Meeting of the Eastern Counties Veterinary Society will be held at the Great White Horse Hotel, Ipswich, on Friday, October 20th, 1950, at 2 p.m. The President, A. H. Dawson, Esq., M.R.C.V.S., will occupy the chair.

AGENDA

Routine business; An Address by Mr. G. C. Knight, F.R.C.V.S., of the Royal Veterinary College, concerning Surgery in Small Animals; Discussion; Arrangements for the Annual General Meeting; Any other business.

K. C. SELLERS, *Hon. Secretary.*

### North of Ireland Division, N.V.M.A.

A GENERAL Meeting of the North of Ireland Veterinary Medical Association will be held in the Lecture Theatre, Queen's University, Elmwood Avenue, Belfast, on Friday, October 20th, 1950, at 7 p.m.

AGENDA

Minutes; Correspondence; Elections and Nominations; Any other business.

A paper enittled "Observations on the so-called 'Summer Mastitis' of dry cattle in Northern Ireland will be given by Mr. I. K. L. Pearson, PH.D., B.SC., M.R.C.V.S. Mr. D. L. Hughes, M.R.C.V.S., Dip. Bact. Director of Thurgarton Research Station, Nottingham, will open the discussion and extend some views on analagous conditions of research work in Great Britain.

Tea will be served after the meeting.

Visitors are cordially invited.

J. K. L. PEARSON, *Hon. Secretary.*

### Southern Counties Division, N.V.M.A.

THE next Meeting of the Southern Counties Veterinary Society will be at the Royal Hotel, St. Peter Street, Winchester, on Tuesday, October 17th, 1950, at 6 p.m.

AGENDA

Routine; Resolution by Mr. E. G. White, seconded by Mr. H. C. Rockett, that, "In view of the imminent bankruptcy of the Society, the annual subscription be increased to 1 gn. from January 1st, 1952"; Discussion by S. L. Hignett, Esq., of his paper on 'Herd Infertility in Cattle," which was presented to the 1950 Congress of the N.V.M.A.; Routine.

The following meeting will be held at The Polygon Hotel, Southampton, on Wednesday, November 15th, 1950, and will be a joint one at the kind invitation of the Southampton Division of the British Medical Association, to which the Society of Medical Officers of Health will also be invited. The invitation also includes a dinner with the members of the B.M.A. at 7.30 p.m. at The Polygon Hotel, prior to the meeting, the price of tickets for which will be announced later, but names must be notified to me well in advance of the meeting.

CHAS. A. FODEN, *Hon. Secretary.*

### Herts and Beds Division, N.V.M.A.

A MEETING of the above Division will be held at 70, Holywell Hill, St. Albans, on October 19th, at 2.30 p.m.

AGENDA

Minutes; Nominations; Correspondence; Paper on "Suturing of Wounds in Small Animals" by R. H. C. Penny, Esq., B.V.SC., M.R.C.V.S.

G. K. BUCKLER, *Hon. Secretary.*

## NOTICES

### Scottish Metropolitan Division, N.V.M.A.

FOLLOWING the James Clark Memorial Unveiling Ceremony in the Canongate Churchyard, a meeting of the Division will take place at Moredun Institute, Gilmerton, Edinburgh, on Wednesday, October 18th, 1950, at 3.30 p.m. The President, Dr. A. D. McEwen, will occupy the chair.

AGENDA

1. Routine Business.
2. A series of short clinical papers will be given by several members and each paper will be followed by a discussion.

SYDNEY JENNINGS, *Hon. Secretary.*

### South-Eastern Division, N.V.M.A.

AN Ordinary General Meeting of the South-Eastern Veterinary Association will be held at the Royal Mount Ephraim Hotel, Tunbridge Wells, on Thursday, October 19th, at 2.30 p.m.

The President, Mr. R. C. U. Fisher, M.R.C.V.S., D.V.S.M., will occupy the chair and all members of the profession are welcome.

AGENDA

Minutes; Correspondence; Nominations; Exhibition of films: Nutrition of Ruminant Animals, Liver Fluke in Great Britain, *Post-mortem* examination of Poultry; Discussion on the above films; *Post-mortem* specimens and cases of interest; Time and place of next meeting; Any other business.

A. I. BEESON, *Hon. Secretary.*

## APPOINTMENTS VACANT

SECOND Assistant required in cattle and canine practice, East Sussex. Salary according to experience. —Box 1172.

ASSISTANT required for mixed practice in Devon. Salary according to experience. Interview expenses paid.—Box 1093.

EXPERIENCED Assistant, eligible L.V.I., required in mainly agricultural practice. Live out. Car provided. Commencing salary £700, increased to £800 after a year's satisfcatory service, then annual increments of £50 to a maximim of £1,000 Generous leisure with use of car. Interview essential, expenses paid.—Tutt, "Rothiemurchus," Winchester.

ASSISTANT required for about six months in high-class small-animal practice near London. Male or female graduate.—Box 1182.

ASSISTANT required to manage branch practice in North Midlands—married or single. Good house, car, and salary £10-£12 weekly. Interview expenses paid.—Box 1178.

ASSISTANT required for mixed practice. Good salary and prospects. Regular leisure and use of car.—Box 1179.

WANTED, experienced male Assistant. Mixed practice Midlands. Salary around £700 per annum. New car provided. References and particulars.—Box 1186.

TEMPORARY Assistant required immediately in agricultural practice. £11 to £15, live in. Capable recent graduate might suit.—Box 1174.

ASSISTANT required early November. Must be fully experienced in cattle practice and with small animals. Eligible L.V.I. Salary according to experience, but minimum of £550 offered, plus comfortable unfurnished ground floor flat rent free.—Full particulars, please, to Messrs. F. I. Thornton, Dorchester, Dorset.

EXPERIENCED Assistant wantned to take charge of mixed branch practice. Married. Small house available. Eligible for L.V.I. Partnership later to suitable applicant.—Jarvis, Much Wenlock, Shropshire. Tel.: Much Wenlock 371.

## APPOINTMENTS VACANT

MARRIED Assistant required for agricultural practice in Cumberland. Must be eligible L.V.I. Flat and car provided. Good salary and commission to suitable applicant.—Box 1182.

BRANCH Manager required, agricultural practice, L.V.I. House available.—Box 1156.

## APPOINTMENT REQUIRED

MR. E. KEMPTON GATFIELD undertakes Locums or Management. Free in October.—c/o 36, Gordon Square, W.C1.

## MISCELLANEOUS

MR. GEORGE FORBES, M.R.C.V.S., will be pleased to undertake X-ray Diagnosis and Short Wave Therapy for members of the profession.—Burley Lodge, Epsom, Tel.: Epsom 1188.

PREGNANCY Diagnosis in mares, cows, bitches, etc.; 24-hour service.—Write for details to M.O. Laboratories Ltd., 24, Welbeck Way, W.1.

SECRETARY Receptionist, good book-keeping essential, needed for country practice in Somerset. Reply with particulars and references. —Box 1171

CANINE nurse, five years' experience, seeks post with Veterinary Surgeon.—Box 1188.

TUBERCULIN, Mallein, etc., may be obtained by members of the veterinary profession from the Royal Veterinary College. Orders should be addressed to the Department of Preventive Medicine, Streatley House, Streatley, Berks.

RADIOGRAPHIC diagnosis with a powerful mobile set would be undertaken in large or small animals, for colleagues at home or away. Immediate veterinary diagnosis.—Hamilton Kirk, M.R.C.V.S., 658, Finchley Road, London. (Spe. 7777.)

MAJOR A. E. CAREY FOSTER, M.R.C.V.S., will be pleased to operate on equine cases of hernia, roarers, etc., for members of the profession. Extensive paddocks for use of post-operative cases. Short wave therapy available for members still without equipment. —Tel.: Epsom 1813.

VETERINARY Laboratory Service for veterinary surgeons offered by Dr. Tom Hare, assisted by A. B. Orr, B.SC., M.R.C.V.S., 529a, Finchley Road, London, N.W.3, telephone Hampstead 3745, includes *post-mortems*, laboratory tests, analyses for poisons, vaccines, etc.

MR. R. J. WALLS, M.S.R., will undertake to X-ray animals for members of the Veterinary Profession. Large powerful mobile unit. Fees 4-6 gns. plus 1s. per mile. Films developed on the spot.—Enquiries, 6, Bentinck Road, Newark, Notts. Telephone and Telegrams: Newark 708.


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**PARTURITION COVERALLS, ETC.**

VETERINARY Surgeons should write for life illustrations of our Parturition Coveralls, Rubber Clinical Coats, Artificial Insemination Garments and Rubber Over-trousers. They are the outcome of suggestions put to us by leading Surgeons. Our list also gives details of Rubber Gloves, Wellington Boots, Overalls, etc., and will gladly be sent free on request.

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